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Development of a Postburn Pruritus Relief Protocol

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Abstract

Background: Post burn pruritus is a syndrome of stressful symptoms that is pervasive and occurs in over 90% of burn patients and continues for years after the burn has healed. Post burn pruritus is experienced by burn survivors that may require medical management and effective interventions. **Purpose:** This article is to show how to relieve post burn pruritus effectively by developing a post burn pruritus relief protocol. **Design:** A descriptive literature review was conducted and relevant empirical articles written during the year of 2000 to 2014 were appraised to create a post burn pruritus relief protocol. Twenty seven out of 79 articles were selected using pre-established inclusion criteria: any age group experiencing burn related pruritus after second or third degree burns. Data bases were Cochrane Central Register of Controlled Trials, CINAHL, EBSCO, PubMed, the National Guideline Clearinghouse, google scholar, and the American Burn Association web site. **Conclusions:** This protocol included both non-pharmacological and pharmacological interventions that have been delineated for use and was developed to apply based on the healing stage: pre-healing, healing, and post-healing.

Introduction

Post burn pruritus (PBP), a severe itching sensation associated with burn injury, has been identified as one of the most debilitating symptoms post burn survivors experience (Ahuja, Gupta, R., Gupta, G., & Shrivastava, 2011; Carrougher et al., 2013; Goutos, 2010; Goutos et al., 2010; Otene & Omuma-egbu, 2013). Pruritus appears the first two weeks following burn injury (Ahuja et al., 2011; Goutos et al., 2010). The prevalence of post burn pruritus has been noted in over 90% of burn patients and can persist in greater than 40% of patients for four to ten years after burn injury (Carrougher et al., 2013). Several studies showed the incidence of onset of post burn pruritus varies from 80%-100% with the onset during the early healing phase and sustaining for many years after injury (Ahuja & Gupta, 2013; Baker et al., 2001; Whitaker, 2001). Research findings have recurrently proposed that PBP management should be one of the top priorities for burn research (Bell & Gabriel, 2009; Brooks et al., 2008). Burn associated pruritus, when persistent, can cause disabling symptoms such as sleep disturbances, anxiety, and interruption in daily activities (Goutos et al., 2009).

Although pruritus in post burn patients is well recognized, there is no consensus on standardized treatment (Bell & Gabriel, 2009; Otene & Onumaegbu, 2013; Richardson, Upton, & Rippon, 2014). Single treatment may be ineffective, but most often therapies focus on either pharmacological or non-pharmacological interventions. However, pharmacological interventions have adverse effects in some population with kidney problems, liver diseases or allergies to specific medicines, which causes pharmacological interventions to be limited to use. Therefore, the purpose of conducting this literature review was to establish a protocol for PBP relief with the integration of evidence based practices, primarily focused on non-pharmacological interventions.

Literature Search

A keyword search was performed to identify relevant literature via Cochrane Central Register of Controlled Trials, CINAHL, EBSCO, PubMed, the National Guideline Clearinghouse, google scholar, and the American Burn Association web site. The key words were burn(s), itching, and pruritus. Due to limited publications, database searches were expanded to all peer reviewed and published studies written in English during the year of 2000 to 2014, conducted with all second and third degree burn populations suffering from post-burn related pruritus. As a result, 79 articles were initially listed from search engines and 26 out of 79 articles were found relevant to the purpose of this review, developing a post burn pruritus relief protocol.

Results

The process of finalizing 26 relevant articles is shown through the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Figure 1). All relevant articles for the treatment of PBP were summarized including the study design, setting, result, and limitation (Table 1). Treatments are categorized in pharmacological and non-pharmacological interventions.

Pharmacological Interventions

Thirteen out of 26 articles identified pharmacological effects on PBP that included both single oral medicine use and two or three combining oral medicine. Examples of effective oral pharmacological interventions include 1) pregabalin (Lyrica®) alone; 2) gabapentin (Neurontin®, Gralise®, Horizant®, Fanatrex FusePag®) alone; 3) pregabalin and two different antihistamines (histamine1 [H1] and histamine2 [H2] blockers); 4) gabapentin and one antihistamine (H1 blocker); 5) gabapentin and two different antihistamines; and 6) combination

of two different antihistamines. According to the randomized controlled trial (RCT) by Ahuja and Gupta (2013), pregabalin alone or combination of two kinds of antihistamines decreased PBP but adding more antihistamines did not decrease PBP additionally. Gabapentin alone or combination of one or two antihistamines reduced PBP in several studies (Ahuja et al., 2011; Goutos et al., 2010; Mendham, 2004). Combination of two different antihistamines also lowered PBP more than using one antihistamine (Baker et al., 2001). Two experimental studies show naltrexone (Vivitrol®, Revia®, Depade®) is supportive in decreasing duration and frequency of itching in patients with PBP and can be used before sleeping as a supplementary method to other anti-pruritic medicine (Jung et al., 2009; LaSalle, Rachelska, & Nedelec, 2007).

Oral medications are more effective when given as scheduled than being given as needed (Baker et al., 2001). However, oral pharmacological interventions have adverse effects. For example, antihistamines are well known for drowsiness (Vallerand, Sanoski, & Deglin, 2016). Pregabalin has withdrawal symptoms such as insomnia, headache, agitation, nausea, anxiety, diarrhea, flu like symptoms, nervousness, major depression, pain, convulsions, hyperhidrosis, and dizziness when abruptly stopped (Vallerand et al., 2016). In addition, most pharmacological interventions are not as effective as non-pharmacological interventions once wounds begin granulating towards the healing stage when pruritus is more concerned (Goutos, 2013).

Administering topical agents in both healing and healed stages of wounds are beneficial to the population with PBP according to several researches (Campanati et al., 2013; Lewis et al., 2012; Nedelec, Rachelska, Parnell, & LaSalle, 2012; Ogawa & Hyaku-soku, 2008). Campanati et al. (2013) reported ozonated oil and hyaluronic acid gel applied to burn associated wounds decreased PBP. The study by Ogawa and Hyaku-soku (2008) revealed medilixir and mugwort lotion were effective in relieving PBP. Mugwort lotion is consisted of mugwort extract, l-

menthol, absolute ethanol, and distilled water. Provase® (Dimethicone) cream was also reported in relieving PBP (Nedelec et al., 2012). Medilixir® (a beeswax and herbal oil cream) reduced PBP when applied to burn associated wounds (Lewis et al., 2012). Moisturizing body shampoo showed effective decrease of PBP (Ratcliff et al., 2005). Botulinum toxin (Botox®) is shown to reduce PBP effectively by using one time dose in those who failed in managing PBP with conventional therapies (Akhtar & Brooks, 2012).

Non-pharmacological Interventions

Another thirteen out of 26 articles reported non-pharmacological methods in relieving PBP. Examples of effective non-pharmacological interventions included: massage therapy, laser therapy (either regular or low level laser [LLLT]), transcutaneous electrical nerve stimulation (TENS), triamcinolone acetonide phonophoresis (TAP), muscle relaxation, silicone gel sheeting (SGS), pressure garment (Unna boot®), and nanocrystalline silver (Acticoat®). Most non-pharmacological interventions showed anti-pruritic effects specifically during the healed stage of burn wounds, whereas massage and Benson muscle relaxation therapy can be used regardless of the stage of healing.

The study by Gurol, Polat, and Akcay (2010), a single RCT, exhibited massage therapy to intact skin decreased PBP among adolescent burn patients at the early phase of burn injury (pre-healing stage). Experimental group's itching level (range: 0-10) was averagely 6.1 before the message therapy and then significantly decreased to 2.5 whereas control group's average itching level slightly decreased from 5.59 to 5.50 (Gurol et al., 2010). They also showed this therapy significantly reduced anxiety and pain in the experimental group (Gurol et al., 2010). There are three other studies showing effective reduction in PBP with message therapy applied directly to healed burn wounds (Cho et al., 2014; Field et al., 2000; Roh, Cho, Oh, & Yoon, 2007). The

study by Cho et al. (2014), a RCT, showed massage therapy led to significant improvement in pain and itching as well as positive changes in scar characteristics. Another RCT is the study by Field et al. (2000) reporting massage therapy resulted in the significant decrease in itching, pain, depression and anxiety among those with PBP. Roh et al. (2007) conducted a RCT demonstrating massage therapy improved pruritus, scar status, and depression among burn patients. The study by Farahani, Hekmatpou, and Khani (2013), a Quasi-experimental study reported Benson muscle relaxation therapy lowered PBP in any healing stages in burn Patients. The researchers supported Benson muscle relaxation therapy was significantly effective in relieving the pain, pruritus, and vital signs of patients suffering from burns (Farahani et al., 2013).

Gaida et al. (2003) showed LLLT significantly decreased PBP. The study by Hultman, Edkins, Wu, Calvert, & Cairns (2013) demonstrated regular laser therapy relieved PBP effectively as well. The experimental study by Hultman et al. (2013) was designed as pretest-posttest. The study's control group was the intact skin of participants and the experimental group was the participants' burn wounds (Hultman et al., 2013).

TENS was proven to reduce itching in the patients suffering from PBP (Hettrick, 2014; Whitaker, 2001). The pilot RCT by Hettrick (2014) stated TENS was significantly effective in PBP reduction when TENS was provided an hour per day for three weeks. The case study by Whitaker (2001) revealed receiving TENS for nine hours a day for two weeks relieved pruritus that resulted in no need of treatment for itching after two weeks. In detail, PBP decreased from 100% to 0% after two week of TENS therapy (Whitaker, 2001).

The RCT by Waked, Nagib, and Ashm (2013) reported TAP reduced PBP as effectively as TENS did. In their study, 20 patients received TAP and another 20 students received TENS

(Waked et al., 203). The effectiveness in relieving PBP in both groups was shown to be significantly positive, but there was no difference regarding the relief of PBP between two groups (Waked et al., 2013).

A case study by Brooks, Phang, and Moazzam (2007) demonstrated two weeks of applying nanocrystalline silver to unhealed wound reduced PBP in five cases with different burn associated wound sizes. This intervention was reported to decrease the pruritus from 7.4 to 3.1 of visual analog scale (VAS), which means significant reduction in PBP (Brooks et al., 2007). The researchers also reported nanocrystalline silver improved wound healing as well as reduction in PBP (Brooks et al., 2007).

Wearing SGS was reported as the effective way in reducing PBP (Li-Tsang, Lau, Choi, Chan, & Jianan, 2006; Li-Tsang, Zheng, & Lau, 2010). The RCT by Li-Tsang et al. (2006) showed experimental group had significantly decreased itching compared to the control group. The study demonstrated participants wearing SGS also had significant improvement in scar thickness and pliability (Li-Tsang et al., 2006). Another RCT by Li-Tsang et al. (2010) showed wearing pressure garment significantly reduced pruritus as well as SGS did. The study also revealed that wound was significantly improved when both pressure garment and SGS were applied together (Li-Tsang et al., 2010).

Development of the PBP Relief Protocol

The outcome of this literature review was synthesized according to the best evidence based outcomes from both combined pharmacological and non-pharmacological interventions. Accordingly, a PBP relief protocol was developed (Figure 2). This protocol was designed according to the three different stages of wound healing: pre-healing (no granulation tissue), healing (partly granulated tissue), and healed stages (scar formation) with recommended dosages

and period for each intervention (Table 2). Non-pharmacological interventions were recommended before pharmacological interventions considering established effectiveness and possible adverse effects of pharmacological interventions.

Utilization of the PBP Relief Protocol

Each stage of wound healing can be managed by both non-pharmacological and pharmacological interventions. Non-pharmacological interventions are less invasive and should be considered as the primary intervention. On the other hand, pharmacological interventions are more invasive and should be used only as a supplement to potentiate the therapeutic effect of non-pharmacological interventions or to minimize possible adverse effects of pharmacological interventions.

Since non-pharmacological interventions are versatile and can be combined with other non-pharmacological and pharmacological interventions, non-pharmacological interventions should be considered first. So pharmacological interventions are recommended only when non-pharmacological interventions are ineffective. In this case, only single pharmacological intervention is initially to be used with any non-pharmacological interventions (Table 2). When single pharmacological intervention is not effective, two or three different medication can be combined. For example, at pre-healing stage, all non-pharmacological interventions (both massage and Benson muscle relaxation therapy) can be used with one or more pharmacological interventions (pregabalin alone, pregabalin and two antihistamines, gabapentin alone, gabapentin and one or two H1 blockers, or a combination of H1 and H2 blockers) (Figure 2).

Discussion

This post burn pruritus protocol is the first evidence based protocol that uses non-pharmacological interventions as the primary method of choice to reduce PBP. Non-

pharmacological and Pharmacological interventions for PBP have been identified and presented in an easily understood protocol to improve patient outcomes and clinical practice. Recommended dosage and duration of each intervention are included to clearly guide clinicians (Table 2). A rehabilitation nurse may utilize this protocol by encouraging patients to use non-pharmacological interventions as a primary intervention for PBP in collaboration with interdisciplinary team members.

This protocol was drawn from mostly RCTs which are the level II of evidence. However, each individual therapy of non-pharmacological interventions has one to three literature support (Table 2). Accordingly, clinicians need to validate the efficiency of this suggested protocol by conducting a pilot study for the patients suffering from PBP. Their pilot study should demonstrate this protocol significantly relieved PBP. The pilot study researchers can use the 5-D Itch Scale (Figure 3), the visual analog scale (Figure 4), and the Itch man scale as valid and reliable instruments for PBP (Elman, Hynan, Gabriel, & Mayo, 2010). In addition, they need to validate the efficacy of this PBP protocol by determining if the protocol: 1) relieved pruritus discomfort; 2) reduced cognitive dysfunctions such as low concentration, agitation, anxiety, and/or flat affect; and 3) increased quality of life (QoL).

Conclusion

This suggested protocol was developed to use non-pharmacological interventions primarily and pharmacological interventions as a secondary treatment. Accordingly, this protocol can be beneficial to patients by minimizing possible adverse effects of oral medications. Another benefit of this protocol is to provide a wide range of interventions with recommended treatment dosages and period. The rehabilitation nurse needs to play a key role in collaborating

with the interdisciplinary team to utilize this protocol. However, the protocol needs to be verified through a pilot study ideally with a RCT design.

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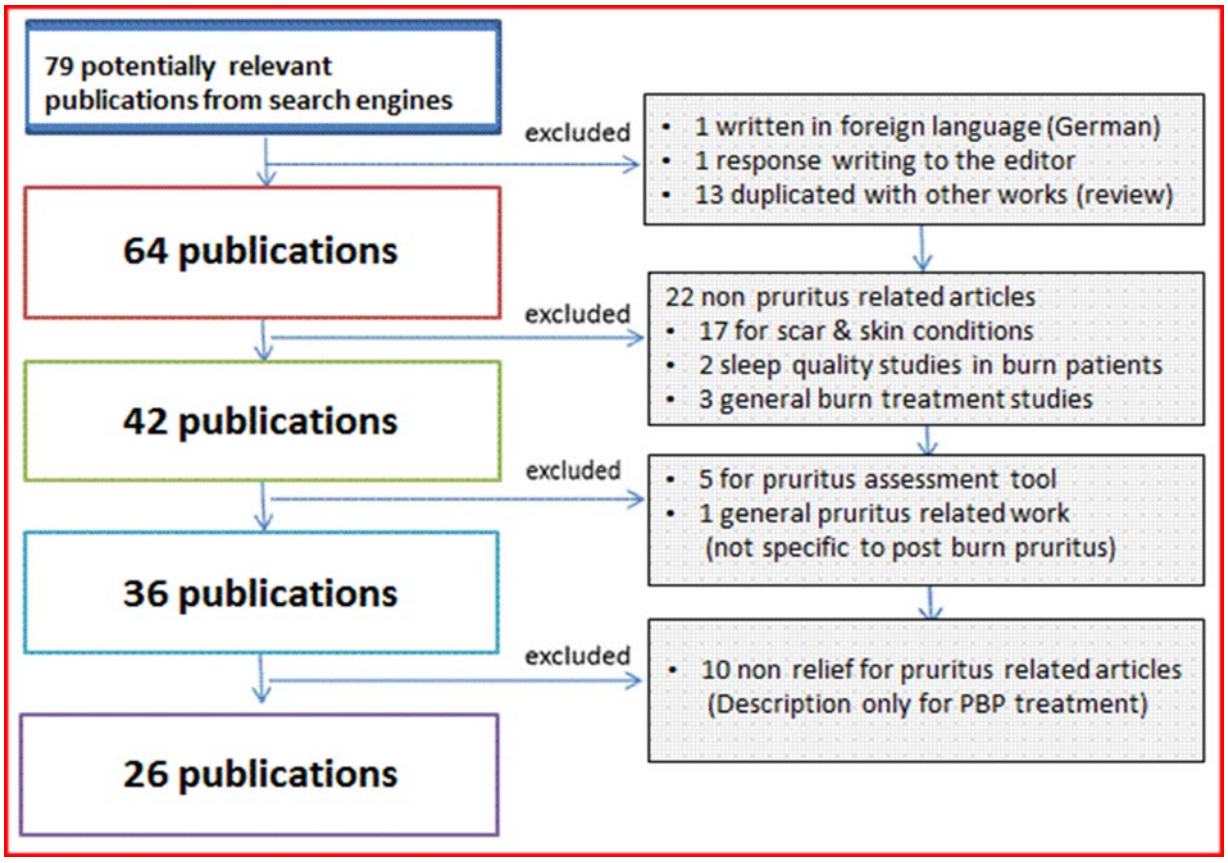

Figure 1. Flow diagram for selection of studies

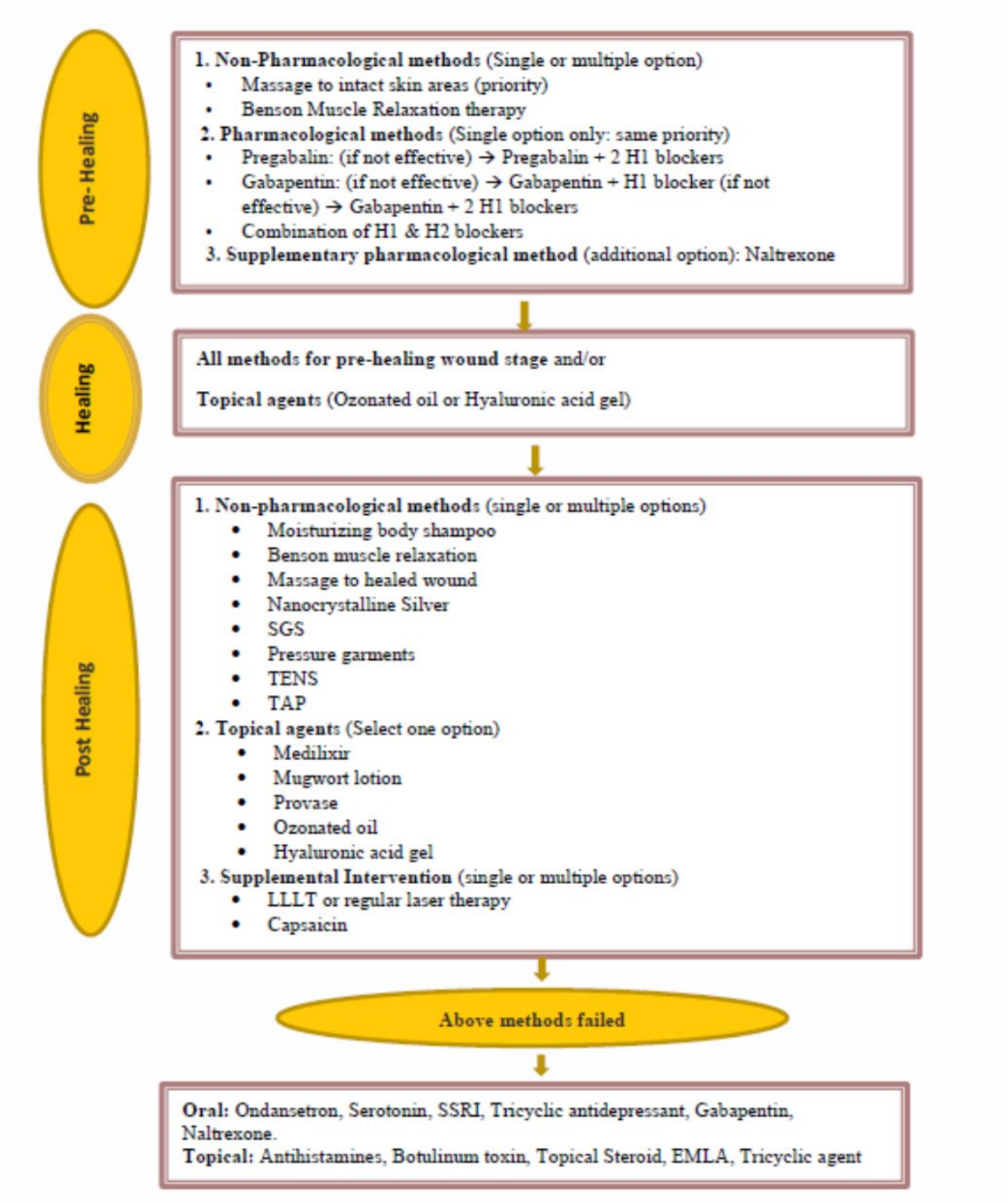

Figure 2. Post Burn Pruritus Relief Protocol

1. **Duration**: During the last 2 weeks, how many hours a day have you been itching?

Less than 6hrs/day	6-12 hrs/day	12-18 hrs/day	18-23 hrs/day	All day
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

2. **Degree**: Please rate the intensity of your itching over the past 2 weeks

Not present	Mild	Moderate	Severe	Unbearable
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

3. **Direction**: Over the past 2 weeks has your itching gotten better or worse compared to the previous month?

Completely resolved	Much better, but still present	Little bit better, but still present	Unchanged	Getting worse
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

4. **Disability**: Rate the impact of your itching on the following activities over the last 2 weeks

	Never affects sleep	Occasionally delays falling asleep	Frequently delays falling asleep	Delays falling asleep and occasionally wakes me up at night	Delays falling asleep and frequently wakes me up at night
Sleep	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

	N/A	Never affects this activity	Rarely affects this activity	Occasionally affects this activity	Frequently affects this activity	Always affects this activity
Leisure/Social	☐	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Housework/ Errands	☐	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Work/School	☐	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

5. **Distribution:** Mark whether itching has been present in the following parts of your body over the last 2 weeks. If a body part is not listed, choose the one that is closest anatomically.

	Present		Present
Head/Scalp	☐	Soles	☐
Face	☐	Palms	☐
Chest	☐	Tops of Hands/Fingers	☐
Abdomen	☐	Forearms	☐
Back	☐	Upper Arms	☐
Buttocks	☐	Points of Contact w/ Clothing	
Thighs	☐	(e.g waistband, undergarment)	☐
Lower legs	☐	Groin	☐
Tops of Feet/Toes	☐		

Figure 3. 5 – D ITCH SCALE (Adopted from Elman, Hyman, Gabriel, & Mayo, 2010)

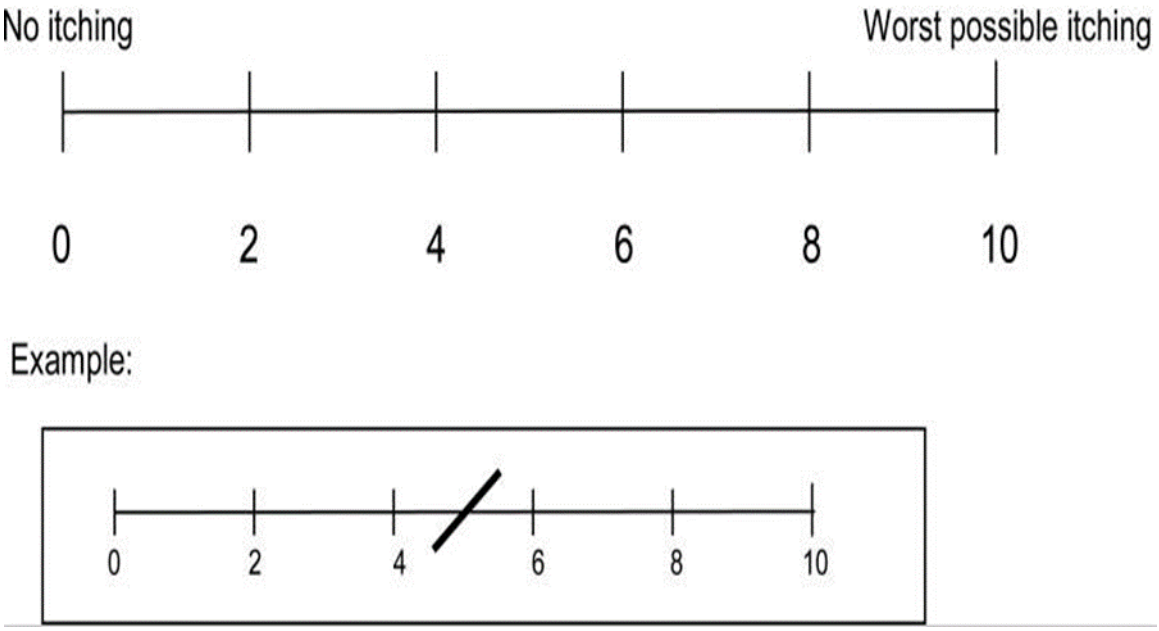

Figure 4. Visual Analog Scale (Adapted from Elman et al., 2010)

Table 1. *Table of Evidence*

No	Authors (year)	Setting/ Participants	Study Design / Intervention Time	Characteristics of Burn Wound	Itching assess-ment Tool	Study Result & Limitations
1	Ahuja & Gupta (2012)	Outpatient setting / 80 Adult Burn pts	RCT / 28days	TBSA > 5%, 2nd degree burns, & wound either in healing or healed	VAS	Pregabalin alone or combined w/antihistamine → ↓ PBP Adding antihistamines does not decrease PBP Limitation: The study did not define end point of anti-pruritic therapy.
2	Ahuja et al. (2010)	Department of burns / 20 Burn pts w/ 12-70 yrs old	RCT / 28days	TBSA > 5%, 2nd degree burns, over 80% of wound epithelialized or healed	VAS	Gabapentin alone or combination w/cetirizine → ↓ PBP Certirizine only does not decrease PBP Limitaion: too small sample size, limited period of data collection, graft size more than 1% excluded, single site study.
3	Akhtar & Brooks (2012)	Outpatient setting/ 8 pts w/failure of managing PBP in the past	Prospective& experimental study/ One time	All healed areas after 2nd-3rd degree burns	VAS	Botox → ↓ PBP in population who failed in managing PBP w/ conventional therapies. 50% had no PBP within 2wks after Botox & no itching up to 9months after treatment. Limitation: Difficult to expect who will require multiple injections to control their symptoms.
4	Baker et al. (2001)	Setting not stated/ 17pts w/ 10-60yrs of age	Double blind, Crossover trial/16days	Partial thickness & any % of TBSA burn. Not described in wound healing stage	VAS	Combining H1 & H2 antagonists: more effective in ↓PBP than H1 antagonist alone during the first stage of treatment. More effective to treat PBP w/ scheduled medication than as needed medication Limitation: Small size of sample, High attrition rate (47%)
5	Brooks et al. (2007)	Inpatient & outpatint settings/ 5cases	Case study/ 2weeks	TBSA of 7-65% w/ unhealed burn wound	VAS	2-week Acticoat® application is effective in ↓PBP Limitation: This study did not indicate the condition of wounds whether they were healed or unhealed. However, it is assumed they were unhealed or in the healing process because acticoat is used for unhealed wounds in current

No	Authors (year)	Setting/ Participants	Study Design / Intervention Time	Characteristics of Burn Wound	Itching assess-ment Tool	Study Result & Limitations
						practice.
6	Campanati et al. (2013)	Unclear setting/ 30pts	Non-RCT / 12weeks	2nd degree burns in healing stage	unknow n	Ozonated oil & hyaluronic acid: Same effect in ↓PBP 12-week topical application. Ozonated oil: more effective than hyaluronic acid in preventing post hyperpigmentation. Limitation: Lack of a histological comparison b/w two agents.
7	Cho et al. (2014)	Rehabilitation hospital/ 146pts w/ hypertrophic scars	RCT/ Average 34.69days	All healed burn wound (scar)	VAS	Massage therapy ↓ in pain, pruritus, & scar characteristics in patients. Limitation: Massage given only for short period (average: 34.7days), so long-term effects not identified. Evolution of hypertrophic scar not considered.
8	Faraha-nil et al. (2013)	Inpatient setting/ 110pts	Quasi-experimental study / 1month	2nd degree burn wounds Stage of wound healing not clear-possibly not healed wound considering population	VAS	20-minute Benson muscle relaxation: effective in ↓PBP. Limitation: No explanation if other methods to reduce pruritus along with relaxation tx. No explanation of frequency of relaxation tx.
9	Field et al. (2000)	Outpatient burn center/ 20pts w/ PBP	RCT / 5weeks	Healed burn wound	VAS	Massage therapy decreased itching, pain, depression & anxiety in burn population w/ severe itching. Limitation: Further study needed for larger sample & long term use of massage therapy.
10	Gaida et al. (2003)	Outpatient setting/ 19burn pts w/ scars	Pretest-posttest design / 8weeks	Healed burn wound (scar)	VAS	LLLT decreased pain & pruritus among all participants. Limitation: Further study needed w/ higher number of sample & control site from different people rather than each person w/ different sites.
11	Goutos et al. (2010)	Inpatient setting/ 91burn pts	Cohort, observational studies/	Partial to full thickness burn injury. Healing stages not	VAS / Itch Man	Monotherapy in PBP: gabapentin monotherapy has more effective than chlorpheniramine. Polytherapy in PBP: Combination of gabapentin,

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		(50-1st part, 41-2nd part of the study)	Intervention time not specified	specified.	Scale	cetirizine, & cyproheptadine is more effective than combination of 3 antihistamines. Limitation: Needs further studies incorporating long term f/u of comparing peripherally & centrally acting agents in late phases of wound healing.
12	Gurol et al. (2010)	Inpatient setting/ 63adolescent burn pts	Experimental study/ 5weeks	2nd-3rd degree burn wound. Healing stage not specified.	VAS	15-minute massage twice per week for 5weeks applied to healthy skin around wounds & surface of wound decreased PBP in adolescent population. Limitation: Small sample size & The study did not specify wound conditions whether it is healed or not. – it is assumed that not all wound are healed according to the fact some pts were getting standard tx including pain & they were enrolled in the study right after admission.
13	Hettrick (2004)	Outpatient clinic/ 20pts w/ age of 18-75yrs	RCT (Pilot study) / 3weeks	2nd to 3rd degree recently healed burn wound	VAS	TENS reduced PBP. Limitation: Hard to generalized to population <18 or > 75yrs of age. Can't apply to inflammatory or proliferative stage of wound healing.
14	Hultman et al. (2013)	Outpatient sugical center/ 147burn pts w/ hypertrophic burn scars	Cohort study/ 6months	All healed burn wounds	VAS	Laser therapy decreased pain, pruritus, pliability, & paresthesia in the population. Limitation: Long-term effect is uknown, Scar component unspecified, Evaluator bias not excluded, No control group exists, & Order of different lasers not examined.
15	Jung et al. (2009)	Inpatient rehabilitation / 19pts treated for burn injury	Retrospectiv e, experimental study/ 2weeks	Healed burn wounds	VAS	With Naltrexone therapy, 14 pts reported improvement in itching, 5 pts reported no change in itching, & 7 pts had side effects. Limitation: Small sample size to generalize, uncertain to use Naltrexone as the first line of tx.

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16	La Salle et al. (2007)	Inpatient & outpatient settings/ 13burn pts age of 19-78	Experimental study/ 2weeks	TBSA of 7-70% & all grafted burn areas. Healing stages not specified	VAS	Naltrexone ↓PBP, frequency & duration of itching. Limitation: Small sample size, itch intensity or qualification of scratching activity to be frequently measured, broader range of burn pts, long term f/u, & a placebo controlled tx group needed.
17	Lewis et al. (2012)	Inpatient setting / 52burn pts, mean age 35	RCT, Pilot study / 24hours	Mean TBSA:7.2%, mostly partial thickness burn wound & newly healed scar	VAS	Medilixir was more effective to minimize PBP than aqueous cream. Limitation: Small sample size
18	Li-Sang et al. (2006)	Outpatient clinic/ 45burn pts	RCT / 6months	Post traumatic hypertrophic scars	VAS	SGS was effective to reduce thickness, pain, itchiness, & pliability of the severe hypertrophic scar. Limitation: Generalization issue due to small size sample & all Chinese participants. Only 16 burn scars out of 45 scars – can the result be applied to specifically to burn scar pts?
19	Li-Tsang et al. (2010)	participant's routine area / 104burn pts	RCT / 6months	Burn scars	VAS	SGS ↓pain & ↓pruritus than ↓scar thickness. CTG & PG showed improvement in scar thickness after 6-month intervention (CTG>PG). Limitation: High drop-rate of participants (19%)
20	Mendham (2004)	Inpatient setting / 35pediatric wound pts	Experimental study/ 4weeks – 18months	Burn wounds and skin loss from meningitis. Not healed wound	Unkno wn	Gabapentin ↓itching in healing wound & ↓ antihistamine intake in pediatric population. Limitation: Gabapentin tx needs cautions for worsening behaviors in pediatric population & RCT is necessary.
21	Nedelec et al. (2012)	Not clear / 18pts having PBP treated in the hospital	RCT, Pilot study / 4weeks	All healed burn wounds (scars)	Yosipo-vitch's question -naire	Provase ↓PBP in frequency & episode of itch, & duration of itch. Limitation: Small pilot study, single center & convenience population, short period of data collection (4wks), & no classification b/w acute & chronic pruritus in post burn population.

No	Authors (year)	Setting/ Participants	Study Design / Intervention Time	Characteristics of Burn Wound	Itching assess-ment Tool	Study Result & Limitations
22	Ogawa & Hyaku-soku (2008)	Inpatient setting/ 14pts w/ hypertrophic scars from burns	Prospective, Cohort study / 2months	All healed burn wounds (scars)	VAS	Mugwort lotion decreased itching & sleep disturbance. Limitation: Need to continue to evaluate effects & mechanism of Mugwort lotion. Further studies needed for evaluating this lotion.
23	Ratcliff et al. (2005)	Inpatient setting / 286burn children	Retrospect-ive chart review / Varied	All burn wounds : Various wound stages	Itch Man Scale	Management protocols for pain, anxiety, stress, & iching in pediatric population offers data to reduce burn related symptoms in the future. i.e: Itching management protocol for children; 1)Moisturizing body shampoo, lotions, & topical ointments (not hydrocortisone creams) 2)Diphenhydramine 1.25mg/kg/dose po Q 6h 3)If itch remains poorly controlled, subsequently add hydroxyzine 0.6mg/kg/dose po q 6h, then cyproheptadine 0.1mg/kg/dose q6h so that one of the medications is given q2hrs Limitation: Possibility of incomplete data due to study design
24	Roh et al. (2007)	Outpatient clinic/ 35burn pts	Pretest – posttest / 3months	Burn scars from partial or full thickness burns on forearm or hand	Itch man Scale	SRMT decreased PBP in burn victims with scars on forearms or hands. Limitation: Small sample size & needs more reliable & objective burn-scar assessment tools.
25	Waked et al. (2013)	Inpatient setting / 40burn pts	RCT/ 1month	2nd & 3rd degree burn wounds, 10-15%TBSA. – All Healed scars	5-D Itch scale	TAP was as useful as TENS to reduce PBP Limitation: No control group in the study & small sample noted.
26	Whitaker (2001)	Inpatient setting / One case	Case study / 2weeks	Healed 70%TBSA flame burn wound (scar)	VAS	2 weeks of TENS was effective in ↓PBP. Day #1: 62.5% decreased in itching within 4hrs of application. Day #2: 88% decreased within 4hrs of application. Day #3: No itching within 4hrs of application. Limitation: More case studies or full-scale study

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						needed.

Notes. CTG = combined pressure therapy and silicone gel sheeting group; h = hour; hrs = hours; H1 = histamine 1; H2 = histamine 2; LLLT = low level laser therapy; PBP = post burn pruritus; PG = pressure therapy group; po = orally; pts = patients; Q = every; RCT = randomized controlled trial; SGS = silicone gel sheeting; SRMT = skin rehabilitation massage therapy; TAP = triamcinolone acetonide phonophoresis; TBSA = total body surface area; TENS = transcutaneous electrical nerve stimulation; VAS = Visual Analog Scale; wks = weeks; w/ = with; ↓= decreased.

Table 2. *Post Burn Pruritus Relief Protocol Guideline (Recommended Dosage)*

Wound Stage	Treatment Plan	Recommended Dosage (refer to article No. in Table 1)
Pre-healing stage	Massage to intact skin	15minutes/day, 2days/week, 5weeks or as needed. (12)
	Benson Muscle Relaxation therapy	20minutes daily for 1month or as needed (8)
	Pharmacological treatment - Pregabalin alone - Pregabalin & two antihistamines - Gabapentin alone - Gabapentin & H1 blocker - Gabapentin & two H1 blockers - Combination of H1 & H2 blockers	(1, 2, 4, 11, 20, 23) - 150-300mg/day (divided by 2 or 3 times) - Pregabalin (same dose), Cetirizine 10-20mg/day (one or twice a day), & Pheniramine 25mg/day before sleep - 300-900mg/day (adult), 5-10mg/kg/day (child) - Gabapentin (same dose) & Cetirizine 10-20mg/day - Gabapentin & Cetirizine (same doses) & Cyproheptadine 4mg every 6hours - Cetirizine: 20mg/day (adult) & 10mg/day (pediatric patient), & Cimetidine: 1200mg/day, divided by 4 (adult), 30mg/kg/day, divided by 4 (child)
	Naltrexone (supplemental pharmacological treatment)	25-50mg/day before sleep for 2weeks (15, 16)
Healing stage	All treatments for pre-healing stage & Topical agents (Ozonated oil or Hyaluronic acid gel 0.2%)	Ozonated oil 2drops/cm² once a day or Hyaluronic acid gel ½ finger tip/cm² daily For 12 weeks or as needed (6)
Healed stage	Benson muscle relaxation	Same dose as above (8)
	Massage to healed wound	15-30minutes, 1-3times/week for 5-12weeks (7, 9, 24)
	Nanocrystalline silver	for 2weeks (5)
	LLLT or regular Laser Therapy	LLLT: 2times/week for 8weeks (10) Regular laser therapy: once per month for 6 month (14)
	TENS	Once a day for 2-3weeks (13, 26)
	TAP	3times/week for 1month (25)
	SGS	Wear 12-24hours/day for 6months (18, 19)
	Pressure garments	Apply as needed (19)
	Topical agents - Medilixir - Mugwort lotion - Provase - Ozonated oil - Hyaluronic acid gel 0.2%	 - Once daily for 2weeks (17) - 2 times/day for 2months (22) - 3 times/day for 4weeks (21) - 2drops/cm² once daily (6) - ½finger tip/cm² daily (6)
After failure with above	Botulinum toxin	One time dose (3)